REMARKS

Applicants respectfully request reconsideration and allowance of all pending claims.

I. Status of the Claims

In view of the Office's refusal to enter the claim amendments requested in Amendment F, filed with the Office on August 22, 2007, applicants resubmit the claims amendments herein. This response is accompanied by a Request for Continued Examination. Accordingly, applicants respectfully request that the Office enter the requested claim amendments.

Claims 48, 49, 52, 53, 59, 61, and 66 remain pending, and claims 48, 52, and 53 have been amended. The amendment to claim 48 is supported at paragraph [0024]. The amendment to claim 52 is supported at paragraphs [0031]-[0032]. The amendment to claim 53 is supported by the table at paragraph [0034].

II. Specification

Applicants acknowledge the Office's withdrawal of the objections to the specification in the Advisory Action dated September 4, 2007.

III. Claim Rejections Under 35 U.S.C. §112, second paragraph

Reconsideration is requested to the objection to the claims as being indefinite. So that the claims more fully comply with 35 U.S.C. §112, second paragraph, applicants have amended claim 48 to require a pH range from 4.0 to 5.2. Applicants, therefore, request withdrawal of the rejection.

IV. Claim Rejections Under 35 U.S.C. §103(a)

Reconsideration is requested of the rejection of claims 48, 49, 52, 53, 59, 61, and 66 as being obvious over GB 1,243,134 in view of Martyak et al. (U.S. 5,258,061) and Zhong et al. (U.S. 6,106,927).

A. The Claimed Invention

Claim 48 is directed to a method for electroless deposition of a nickel layer with internal compressive stress on a substrate. In relevant part, the method comprises:

> ...contacting the substrate with an electrolyte comprising a nickel metal base salt, a reducing agent, a complexing agent, an accelerator, and a stabilizer to thereby electrolessly deposit the nickel layer with internal compressive stress on the substrate, wherein electroless deposition occurs at a deposition rate of 7 µm/h to 14 µm/h with a throughput of 14 to 22 MTO;
>
> wherein the nickel metal base salt of the electrolyte comprises an anion selected from the group consisting of acetate, formate, nitrate, oxalate, propionate, citrate, ascorbate, and combinations thereof;
>
> ...wherein the complexing agent is selected from the group consisting of 2-hydroxypropanoic acid, propanedioic acid, and a combination thereof;
>
> wherein during electroless deposition, the electrolyte is buffered to a self-regulating pH between 4.0 and 5.2...

The electroless deposition method defined by claim 48 employs an electrolyte comprising a complexing agent chosen from 2-hydroxypropanoic acid, propanedioic acid, or a combination of the two. As stated in paragraph [0027] of applicants' specification:

> Through the use of these compounds the dissolved nickel becomes complexly bound in an especially advantageous way, so that by means of continuous addition of such complexing agents the deposition rate can be kept in a corresponding interval of 7 to 14 µm/h, preferably 9 to 12 µm/h.

Accordingly, applicants discovered and disclosed that by adding these complexing agents, both initially and in the makeup solutions (see claims 52 and 53) during the electroless plating operation, the plating speed may be maintained within the desired interval (i.e., between 7 µm/h to 14 µm/h) during an extended useful life of the electrolyte (i.e., 14 to 22 MTO).

Moreover, by limiting the choice of anion of the nickel metal base salt to those volatile anions listed in claim 48, the pH of the composition is self-regulating during electroless deposition within the claimed range. See, for example, paragraph [0024] of applicants' specification:

> Since during the reaction the pH decreases due to the continuous formation of H^+ ions and it must be kept in the set range in a costly way by means of alkali media such as a hydroxide, carbonate or, as is usually preferred, by ammonia, there is particular advantage in the sole use of metal salts whose anions are volatile and that preferably derive from the group consisting of the acetates, formates, nitrates, oxalates, propionates, citrates and ascorbates. This is based on the fact that in the deposition of the metal-phosphorus layers anions of the acetates, formates, nitrates, oxalates, propionates, citrates and ascorbates are formed, which react with the sodium carbions [sic; possibly, cations] from the sodium hypophosphite to form basic sodium salts. The electrolyte in accordance with the invention thus operates during the entire deposition process in a pH range from 4.0 to 5.2, preferably 4.3 to 4.8, without having to add large amounts of alkali media. Because of the extremely advantageous pH self-regulation it is possible to avoid continuous monitoring of pH as well as the addition of alkali additives.

B. Disclosures of the Prior Art

GB1,243,134 discloses a method for electroless deposition of nickel-phosphorus layers from an electroless deposition composition comprising nickel ions and a source of hypophosphite as a reducing agent. Glutamic acid or a glutamate salt is used as a complexing agent. See page 2, lines 9-24 and 46-56. The disclosure of the GB1,243,134 reference lists myriad advantages associated with using glutamate as the complexing agent. For example, at lines 33-38, the reference states that:

> It has been found that glutamic acid and its water soluble salts are ***highly effective*** chelating or complexing agents in electroless nickel plating baths and ***impart superior stability*** without deleteriously affecting the rate of nickel depositions.

As stated at page 4, lines 30-42, glutamic acid imparts so much superior stability, that:

> ...it has been found that the baths may be replenished from 15-20 times...without decomposition or breakdown whereas available prior art baths generally decompose after only about 7-8 replenishments.

The composition exemplifed at Example 1 consisted of three components: nickel sulfate, monosodium glutamate, and sodium hypophosphite. This composition "could be operated for at least 15 cycles...before decomposing." See Page 4, lines 103-105.

Glutamic acid is even cited for the prevention of precipitation of nickel salts, such as nickel phosphites. Exultants, such as succinic acid, which may be added as exultants, pose a risk of nickel succinate precipitation. The addition of glutamic acid, however, alleviates even this problem, as stated at page 4, lines 24-29:

> In addition to effectively controlling the formation and precipitation of nickel phosphite, the glutamate ions also prevent the precipitation of nickel succinate.

Given the praises heaped upon the use of glutamic acid and glutamate salts as complexing agents, it should be not surprising that the GB1,243,134 reference does not disclose the use other complexing agents, such as lactic acid or propanedioic acid, nor does the reference teach that these complexing agents, used alone or in combination, may be used to maintain a plating rate within a desired range through multiple bath cycles.

GB1,243,134 additionally does not disclose an electroless nickel plating solution in which the pH is self-regulating during electroless deposition within the pH range from 4.0 to 5.2. As stated at page 3, lines 111-121:

> Preferably, the pH of the replenisher solution is adjusted to be on the order of 6.5 to 7.0 by the addition of an alkaline material such as the above referred to mixture of ammonium hydroxide and water. During plating, the hydrogen ion concentration in the bath tends to increase. This hydrogen ion buildup is counteracted by the relatively high pH of the replenisher solution so that the pH of the bath can be maintained at the desired 4.5-4.7 level.

Accordingly, the GB1,243,134 explicitly states that the pH of the electrolyte during an electroless plating operation must be maintained within the desired pH range by the addition of a highly alkaline replenisher solution.

Martyak et al. (U.S. 5,258,061) disclose a method for recycling electroless nickel plating solutions using solvent extraction and anion filtration. Although they discuss lactic acid and glutamic acid as potentially applicable complexing agents, they do not disclose any physical or chemical properties of these complexing agents nor do they attribute any particular advantages to using any particular complexing agents, and in particular do not disclose that lactic acid and glutamic acid are equivalents. See Col. 2, lines 13-42. If anything, however, the ordinarily skilled person would have concluded that lactic acid is not equivalent to glutamic acid, particularly since GB1,243,134 demonstrated the stabilizing effect of glutamic acid, while Martyak et al. *demonstrates the instability of a bath comprising lactic acid*. In Example 2, Martyak et al. tested the stability of an electrolyte that contained lactic acid as a chelating agent and found that the electrolyte exhibited poor stability and shortened useful life, unless a particular additive was added to the bath. Example 2 tested the stability of the bath of Example 1, which contained lactic acid as a chelating agent. As stated by Martyak et al., the electrolyte of Example 1 "exhibited good initial stability but decomposed *after three hours.*" See Col. 6, lines 38-39. The bath could only be made stable by the addition of dimethylamine.

Zhong et al. (U.S. 6,106,927) disclose a method for depositing ultra-smooth nickel-phosphorus layers by an electroless deposition method. This may be accomplished by incorporating metal ions, such as aluminum ions and copper ions, into the electroless plating bath. Zhong et al. discuss potentially applicable complexing agents at Col. 5, lines 10-16. Zhong et al., like Martyak et al., do not disclose any physical or chemical properties of these complexing agents nor do they attribute any particular advantages to any particular complexing agent. None of the disclosures therein would have allowed the ordinarily skilled person to conclude that lactic acid and glutamic acid are somehow "equivalent."

C. The Office's Proposed Combination

Since the GB1,243,134 reference does not disclose the claimed complexing agents, the Office asserts that the electroless nickel plating solution described in GB1,243,134 may be modified with lactic acid as disclosed in Martyak et al. and

Zhong et al. since they teach that "Conventional chelating (complexing) agents that can be used equivalently are 'lactic acid' (another name for 2-hydroxypropanoic acid) and 'glutamic acid'. Col. 2, line 25-30." See page 7 of the Office Action dated June 22, 2007.

D. Deficiencies in the Office's *Prima Facie* Case of Obviousness

The Office's *prima facie* case of obviousness is deficient for at least several reasons: (1) The combination of references does not establish a *prima facie* case of obviousness since the cited references do not disclose an electroless nickel electrolyte that is self-regulating with regard to pH during electroless nickel plating, (2) The combination of references does not establish a *prima facie* case of obviousness since there is no reason to combine the references in the manner asserted by the Office, either due to speculated "equivalence" of glutamic acid and lactic acid or for any other reason, and (3) The *prima facie* case of obviousness is rebutted since the references teach away from their combination.

(1) The combination of references does not establish a *prima facie* case of obviousness since the cited references do not disclose an electroless nickel electrolyte that is self-regulating with regard to pH during electroless nickel plating.

As stated in claim 48, "...***during electroless deposition***, the electrolyte is buffered to a self-regulating pH between 4.0 and 5.2..." In other words, the electrolyte is not just initially buffered to a pH between 4.0 and 5.2, but the behavior of the electrolyte is such that its pH remains within that range despite the fact that electroless nickel deposition produces protons, which would tend to lower the pH.

The cited references do not disclose this element of the claims, and as such, the combination of references does not establish the *prima facie* case of obviousness. As required by MPEP §2143.03:

> **2143.03 All Claim Limitations Must Be Taught or Suggested**
> To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under **35 U.S.C. 103**, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

GB1,243,134 does not disclose an electroless nickel plating solution in which the pH is self-regulating within the pH range from 4.0 to 5.2 during an electroless plating operation. As stated at page 3, lines 111-121:

> Preferably, the pH of the replenisher solution is adjusted to be on the order of 6.5 to 7.0 by the addition of an alkaline material such as the above referred to mixture of ammonium hydroxide and water. During plating, the hydrogen ion concentration in the bath tends to increase. This hydrogen ion buildup is counteracted by the relatively high pH of the replenisher solution so that the pH of the bath can be maintained at the desired 4.5-4.7 level.

Accordingly, the GB1,243,134 explicitly states that the pH of the electrolyte during an electroless plating operation must be maintained within the desired pH range by the addition of a highly alkaline replenisher solution.

Neither Martyak et al. nor Zhong et al. disclose that their electrolytes are similarly buffered during electroless deposition. Since the burden is clearly on the Office to show the element is present in the cited references (see MPEP §2142) and neither reference discloses this element, the deficiencies of the prior art must be resolved in favor of the applicants.

Accordingly, since the cited GB1,243,134 explicitly states that their electrolyte is non-self-regulating with regard to pH during an electroless plating operation and since neither of the Martyak et al. and Zhong et al. references correct this deficiency, the cited references fail to establish a *prima facie* case of obviousness for failing to disclose all of the claimed elements.

(2) The combination of references does not establish a *prima facie* case of obviousness since there is no reason to combine the references in the manner asserted by the Office, either due to speculated "equivalence" of glutamic acid and lactic acid or for any other reason.

It is further significant that there has been no reason articulated as to why one skilled in the art would modify the specific teachings of GB1,243,134, Martyak et al., and Zhong et al. to achieve applicants' claimed electroless deposition method. As recently emphasized by the Supreme Court in *KSR v. Teleflex*:

> ...a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, ***it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.*** This is because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. (Emphasis added.) *KSR*, 82 USPQ2d at 1396.

> Often, it will be necessary ... to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate this review, this analysis should be made explicit. *KSR*, 82 USPQ2d at 1396.

In the present situation, no *reason* was given in either the Office Action or the Advisory Action to adapt or modify GB1,243,134's electrolyte and method, which is based on the discovery of the advantageous properties of using glutamate as a complexing agent, with any aspect of the Martyak et al. or Zhong et al. references to achieve applicants' electroless deposition method using a highly stable, pH self-regulating electrolyte. Accordingly, the cited combinations fail to establish the obviousness of the claims under the standard outlined in KSR.

Perhaps the Office's assertion that somehow "Martyak teaches that lactic acid and glutamic acid can be equivalently used as a complexing/chelating agent" provides a reason for the Office's proposed modifications. This rationale is clearly suspect given the disparate disclosures of the cited references.

First, although the respective disclosures may be read as suggesting the applicability of glutamic acid and lactic acid in an electroless nickel plating bath, neither Martyak et al. nor Zhong et al. teach the equivalence of these acids in such a bath. Rather, the references merely mention these two acids as possible nickel complexing agents with no further discussion of their physical or chemical properties, no discussion as to how those physical or chemical properties affect the function of an electroless nickel plating bath, and no explicit statement anywhere that they affect the function of an electroless nickel plating bath equivalently. Just because two items are mentioned in the same document does not mean they are presented as equivalents. McDonalds' menu lists Big Mac, Filet O' Fish, and Quarter Pounder, but just listing them on the same menu does not mean they are equivalent. What is significant here and overlooked by the Office is that there is absolutely no suggestion by Martyak or the other art of the equivalence of glutamic acid and lactic acid.

Second and perhaps more tellingly, the ordinarily skilled person would have been likely to conclude based on the whole disclosures of the cited references that glutamic acid and lactic acid are not equivalent. As stated above, the GB1,243,134 reference extols many virtues of using glutamic acid. See for example, page 2, Col. 1, lines 25-45 of GB1,243,134:

> It has been found that ***glutamic acid and its water soluble salts*** are highly effective chelating or complexing agents in electroless nickel plating baths and ***impart superior stability without deleteriously affecting the rate of nickel deposition.***

Lactic acid is, however, explicitly disparaged as unduly slowing the deposition rate in the GB1,243,134 reference at page 1, lines 63-71:

> Many chelating agents, such as ***organic hydroxy acids, have been found unsatisfactory*** in practice because, when added to the bath, they unduly retard the deposition of nickel. For example, tartaric acid, malic acid and gluconic acid have been reported as unsatisfactory since only negligible amounts of nickel are deposited in their presence. (Emphasis added)

Despite this, the Office asserts in the Advisory Action that GB1,243,134 combined with Martyak et al. would allow the ordinarily skilled person to understand that "this is not a problem with lactic acid." The Office cites Example 1 of Martyak et al. as showing that plating can occur in as little as 20 minutes. However, a statement that plating was allowed to occur for 20 minutes is totally irrelevant to showing a plating rate.

Moreover, Martyak et al. show that lactic acid does not impart the same stabilizing effect as glutamic acid. See Col. 6, lines 38-39, in which they state that the electrolyte of Example 1 "exhibited good initial stability but decomposed *after three hours.*"

Simply stated, the Office cannot show any evidence whatsoever that lactic acid and glutamic acid are equivalent, and the Office only knows that lactic acid and propanedioic acid impart special advantages in an electroless nickel plating composition because of information gleaned from applicants' disclosure, such that the Office is essentially using applicants' work against them. This is the sort of hindsight reasoning that the Supreme Court has recently warned against in the KSR Int'l Co. v. Teleflex Inc., 127 S.Ct. 1727, 1742; 82 U.S.P.Q.2d 1385 (S.Ct. 2007): "quoting *Graham*, 383 U. S., at 36 (warning against a "temptation to read into the prior art the teachings of the invention in issue" and instructing courts to...guard against slipping into the use of hindsight...(quoting *Monroe Auto Equipment Co.* v. *Heckethorn Mfg. & Supply Co.*, 332 F. 2d 406, 412 (CA6 1964)))." KSR Int'l Co. v. Teleflex Inc., 127 S.Ct. 1727, 1742; 82 U.S.P.Q.2d 1385 (S.Ct. 2007).

(3) The *prima facie* case of obviousness is rebutted since the references teach away from their combination.

As established by MPEP §2145 Part X.D.2., a showing of teaching away is sufficient to rebut a *prima facie* case of obviousness:

> **2. References Cannot Be Combined Where Reference Teaches Away from Their Combination**
> It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983) (The claimed catalyst which contained both iron and an alkali metal was not suggested by the combination of a reference which taught the interchangeability of antimony and alkali metal with the same beneficial result, combined with a reference expressly excluding antimony from, and adding iron to, a catalyst.).

In this case, GB1,243,134 explicitly teaches away from the proposed combination at page 1, Col. 1, lines 63-71:

> Many chelating agents, such as ***organic hydroxy acids, have been found unsatisfactory*** in practice because, when added to the bath, they unduly retard the deposition of nickel. For example, tartaric acid, malic acid and gluconic acid have been reported as unsatisfactory since only negligible amounts of nickel are deposited in their presence. (Emphasis added)

Accordingly, GB1,243,134 teaches away from including organic hydroxy acids, such as lactic acid, in electroless nickel plating solutions. In view thereof, the Office's asserted modification is an improper basis under the guideline stated at MPEP §2145 Part X.D.2.

The *Grasselli* decision is "on all fours" with the instant case. In *Grasselli*, the Federal Circuit held that it was improper to combine a reference teaching the interchangeability of antimony and alkali metal in a catalyst with a reference expressly excluding antimony from the catalyst. Likewise, it is improper under *Grasselli* to combine Martyak et al. or Zhong et al., which may be asserted for disclosing the interchangeability of glutamic acid and lactic acid, with GB 1,243,134, which expressly excludes organic hydroxy acids, including lactic acid.

Moreover, the references contain no particular disclosure that would cause the ordinarily skilled person to ignore this teaching away. Again, GB1,243,134 explicitly discusses additional advantages of using glutamic acid while none of the references discuss any advantages that would suggest the use of lactic acid. See Page 2, Col. 1, lines 25-45 of GB1,243,134:

> In accordance with the present invention, it has now been found that effective control of the formation and precipitation of nickel phosphite in electroless nickel plating may be achieved through the use of a bath comprising an aqueous solution of a water soluble nickel salt, a water soluble hypophosphite and glutamic acid or a water soluble salt thereof. It has been found that ***glutamic acid and its water soluble salts*** are highly effective chelating or complexing agents in electroless nickel plating baths and ***impart superior stability without deleteriously affecting the rate of nickel deposition.*** Baths containing glutamic acid or a water soluble glutamic acid salt ***prevent or substantially minimize the formation and precipitation of nickel phosphite*** and ***may be operated for more extended periods of time than available prior art baths without decomposition.*** (Emphasis added.)

Accordingly, GB1,243,134 discloses at least three advantages of using glutamic acid: (1) superior stability, (2) minimized nickel precipitation, and (3) extended operability without decomposition. Neither GB1,243,134 nor the Martyak et al. and Zhong et al. references demonstrate that any other complexing agents, such as lactic acid, are capable of achieving these advantages. Nor do these references attribute any other advantage to lactic acid that would have motivated the ordinarily skilled person toward modifying the electroless nickel plating solution of GB1,243,134 by using lactic acid.

Simply stated, the combination of references would not have provided the ordinarily skilled person with any basis for modifying the solutions described in the GB1,243,134 reference since: (1) The references teach away from their combination, and (2) the references do not include any disclosure, such as advantages of using lactic acid, that would cause the ordinarily skilled person to ignore this teaching away.

Inasmuch as the combined disclosures of the prior art fail to disclose a method for electroless deposition of a nickel layer having all of the features of claim 48, the Office has failed to establish its *prima facie* case of obviousness. Accordingly, applicants respectfully request that the rejection be withdrawn.

Pending dependent claims 49, 52, 53, 59, and 61 depend from claim 48 and are therefore patentable for the same reasons as claim 48 and by virtue of the additional requirements therein. Claims 50-51 and 60 have been canceled.

CONCLUSION

In view of the foregoing, applicants respectfully request reconsideration and allowance of the pending claims.

Respectfully submitted,

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